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THE PREDICTION OF STUDENT ACCOMPLISHMENT IN COLLEGE.

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THIS STUDY PREDICTED STUDENT ACHIEVEMENT IN COLLEGE AFTER COMPREHENSIVE ASSESSMENT OF STUDENT ACHIEVEMENT AND POTENTIAL IN HIGH SCHOOL. THE STUDENT SAMPLE OF 2,792 SOPHOMORES AND 1,095 FRESHMEN WAS OBTAINED FROM A FOLLOW-UP OF STUDENTS WHO PARTICIPATED IN THE AMERICAN COLLEGE SURVEY IN 1964 AND 1965, AND WHO HAD TAKEN THE AMERICAN COLLEGE TESTING BATTERY FOR ADMISSION TO COLLEGE. PREDICTORS INCLUDED SCORES ON ACT TESTS, HIGH SCHOOL GRADES, AND SCORES ON A CHECKLIST OF EXTRACURRICULAR ACHIEVEMENT. CRITERIA INCLUDED COLLEGE GRADES, SCORES ON 12 SCALES MEASURING EXTRACURRICULAR ACHIEVEMENT IN COLLEGE, AND SCORES ON A SCALE ASSESSING RECOGNITION FOR ACADEMIC ACCOMPLISHMENT. RESULTS INDICATE THAT NON-ACADEMIC ACCOMPLISHMENT CAN BE ASSESSED WITH MODERATE RELIABILITY. BOTH ACADEMIC AND NON-ACADEMIC ACCOMPLISHMENT CAN BE PREDICTED TO A USEFUL DEGREE. NON-ACADEMIC ACCOMPLISHMENT IS LARGELY INDEPENDENT OF ACADEMIC POTENTIAL AND ACHIEVEMENT. THIS STUDY INDICATES THAT COLLEGES SHOULD FIND STUDENTS WHO ARE OUTSTANDING PERFORMERS OUTSIDE THE CLASSROOM AS WELL AS THOSE WHO WILL DO WELL IN THE CLASSROOM. THIS IS ACT RESEARCH REPORT NO. 13, JUNE, 1966. (SK)

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THE PREDICTION OF STUDENT ACCOMPLISHMENT IN COLLEGE

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Summary

In samples with a broad range of talent, the academic and non-academic achievements of college students were predicted. Criteria included college grades, twelve scales designed to measure notable extra-classroom accomplishment in college, and one scale to assess recognition for academic accomplishment. Predictors included scores on ACT tests, high school grades, and six scales measuring non-academic accomplishment in high school. Results indicate that non-academic accomplishment can be assessed with moderate reliability, that both academic and non-academic accomplishment can be predicted to a useful degree, and that non-academic accomplishment is largely independent of academic potential and achievement.

The Prediction of Student Accomplishment in College

James M. Richards, Jr., John L. Holland, and Sandra W. Lutz

The present study aims to predict student achievement in college from a comprehensive assessment of student achievement and potential in high school. Previous studies designed to predict academic and extracurricular achievement in college for students of superior scholastic aptitude (Holland, 1958, 1959, 1960, 1961; Holland & Astin, 1962, Nichols & Holland, 1963; Holland & Nichols, 1964) are extended by this study, which is similar to them in its goals and longitudinal method. It differs from them, however, in that predictions are made for students with a broad range of academic potential.

The present study is also related to many other investigations of similar problems. Among these problems are the relationship between academic potential and originality, the description of creative persons, the development of criteria of creative performance, and the prediction of adult accomplishment. Researchers who have worked on such problems include: Astin (1962); Barron (1963); Buel (1965); Chambers (1964); Cicirelli (1965); Flescher (1963); Getzels and Jackson (1962); Gough, Hall, and Harris (1963); Guilford (1964); Hoyt (1965); Locke (1963); MacKinnon (1960); Mann (1958); Price, Taylor, Richards, and Jacobsen (1964); Skager, Schultz, and Klein (1965); Sprecher (1959); Taylor, Smith, and Ghiselin (1963); Thorndike and Hagen (1959); Torrance (1963); and Wallach and Kogan (1965).

The rationale for this study is that typical measures used in the selection of college students--tests of academic potential and high school grades--concentrate on only one dimension of talent and ignore other important dimensions (Holland & Richards, 1965). Accordingly, if we want to find college students who will do outstanding things outside the classroom and in later life, we need a record of student achievements outside the classroom in high school. The present study examines the predictive validity of one such record of student achievement.

Method

Predictors. The predictive variables included the following measures:

1. ACT Tests. The test battery, a college admissions test administered nationally, yields the following subtest scores: English, mathematics, social studies, and natural science. Each score is converted to a common scale with a mean of approximately 20 and a standard deviation of about 5 for college-bound high school seniors. The reliabilities of the ACT tests (American College Testing Program, 1965), the high correlations between the ACT battery and other similar measures (Eells, 1962), and the similar relationship of the ACT battery and of similar measures to college grades (Munday, 1965) all indicate that the ACT battery is a typical measure of academic potential. Therefore, we would not expect markedly different results in the present study if we had used some other academic test or test battery.

2. High School Grades. As a regular part of the ACT procedure, persons taking the ACT battery report the grades they have received in

high school courses in four areas: English, mathematics, social studies, and natural science. Research by Davidsen (1963) indicates that in a large sample such self-reported grades correspond closely to the high school transcripts. A reanalysis of Davidsen's data by the present authors yielded a correlation of .92 between student-reported and school-reported grades. The measure used in the present study is the overall average on a four-point scale (A = 4, B = 3, etc.) of all grades reported. In another study by Hoyt (1963) the predictive efficiency of average self-reported grades equaled the predictive efficiency of the student's rank in the high school class obtained from his transcript.

3. Extracurricular Achievement Record. We used checklists of extracurricular accomplishment for the high school years to obtain scores in the following areas: art, music, literature, dramatic arts, leadership, and science (Holland & Nichols, 1964). Items ranged from common and less important accomplishments to rare and more important ones. For example, science items included accomplishments such as: did an independent scientific experiment; won a prize or award of any kind for scientific work or study; had scientific paper published in a scientific journal. The remaining scales consisted of similar items planned to assess a broad range of achievement. The score on each scale is simply the number of accomplishments the student has attained.

The achievement record was obtained as part of the American College Survey. The Survey booklet contains several sections designed to elicit information about a student's aspirations, achievements, attitudes,

interests, potentials, values, and background (Abe, Holland, Lutz, & Richards, 1965). In the American College Survey sample, the reliabilities (K-R 20) of the achievement scales ranged from .72 to .84 for men and from .65 to .81 for women.

Student Sample. The student sample was obtained from a follow-up of students who participated in the American College Survey (Abe et al., 1965). In the original study, a comprehensive assessment was administered to 12,432 college freshmen in 31 institutions of higher education during the months of April or May of 1964. The sample for the present study is restricted to the 7208 students at 22 of the 29 colleges participating in the follow-up study who also took the American College Testing battery in the academic year 1962-63 as part of their application for admission to college. The record of college accomplishments for these students was obtained in the spring of 1965 at the end of their sophomore year in college.

In September of 1964, a second study involving the American College Survey was conducted in which the same comprehensive survey was administered to 5668 entering freshmen at six colleges.[1] This second sample of 2483 is also restricted to the freshmen in the larger group who took the American College Testing battery as part of their application for admission to college. The follow-up data for these students also was collected in the spring of 1965 at the end of their freshman year in college.

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[1]The colleges for the two samples in this study are shown in Table A of the Appendix.

Each college was responsible for the administration of the follow-up questionnaire. Several techniques were used to contact students: some colleges had students fill out the questionnaire in English classes, convocations, or other group sessions; other colleges polled their students by mail. Complete follow-up data was obtained for 2792 sophomore students (1373 men and 1419 women) and 1095 freshman students (503 men and 592 women). Follow-up data was thus obtained for 39% of the sophomores and 44% of the freshmen. Students with missing follow-up data include both students who left college and students still enrolled in college who failed to complete the follow-up questionnaire.

Because this is a low return rate, it is important to know what biases there may be in the sample with follow-up data. Accordingly, *t* tests were computed between students with and without follow-up data on each of the predictor variables in each of the groups. While each of these *t* tests is not completely independent of every other test (some of the variables are correlated to a substantial degree), for the purposes of this study, any error introduced is conservative since it is more likely that a number of significant differences will be found between students with and without follow-up data. The results are summarized in Table 1.

The primary trend in Table 1 is for students with missing follow-up data to have significantly lower ACT scores and high school grades. This is to be expected, of course, since this group includes students who left college because of academic failure. However, because the N's in this study are very large, a small absolute difference can be highly significant.

Table 1

Comparison of American College Survey Students with and without Follow-up Data

Variable	College Freshmen					College Sophomores				
	With Follow-up		Missing Follow-up		t[a]	With Follow-up		Missing Follow-up		t[a]
	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
Men	(N=503)		(N=633)			(N=1373)		(N=2379)		
Science Ach.	1.016	1.760	0.889	1.816	1.19	1.417	2.073	1.531	2.370	1.52
Leadership Ach.	3.161	2.446	3.231	2.712	.46	4.374	2.638	4.315	2.720	.65
Drama Ach.	1.103	1.610	1.144	1.802	.41	1.790	2.008	1.851	2.175	.87
Art Achievement	0.543	1.350	0.625	1.616	.93	0.719	1.565	0.931	1.998	3.59**
Literary Ach.	0.565	1.027	0.605	1.188	.61	0.798	1.270	0.808	1.436	.22
Music Achievement	1.050	1.626	0.900	1.862	1.44	1.504	2.200	1.565	2.405	.79
ACT English	18.344	4.360	17.981	4.342	1.40	20.047	4.244	19.106	4.569	6.36**
ACT Math	21.541	5.769	20.889	5.273	1.96*	23.556	5.797	21.984	5.770	8.02**
ACT Social St.	22.487	5.362	21.744	5.481	2.29*	21.988	5.343	20.961	5.539	5.58**
ACT Nat. Science	22.817	5.395	22.455	5.234	1.14	23.458	5.182	22.088	5.540	7.61**
High School GPA	2.568	0.617	2.429	0.615	3.76**	2.848	0.714	2.661	0.735	7.79**
Women	(N=592)		(N=755)			(N=1419)		(N=2037)		
Science Ach.	0.566	1.322	0.357	0.995	3.17**	0.813	1.579	0.867	1.923	.90
Leadership Ach.	3.910	2.230	3.838	2.270	.59	4.755	2.308	4.800	2.363	.56
Drama Ach.	1.505	1.827	1.447	1.814	.59	2.274	2.131	2.366	2.293	1.21
Art Achievement	0.833	1.512	0.861	1.708	.31	0.977	1.754	1.080	1.897	1.63
Literary Ach.	0.953	1.313	0.944	1.361	.12	1.265	1.519	1.259	1.619	.11
Music Achievement	1.169	1.540	1.004	1.482	1.99*	1.847	1.995	1.924	2.201	1.07
ACT English	20.426	3.993	20.261	3.959	.76	22.285	3.872	21.452	4.135	6.04**
ACT Math	19.328	5.673	18.057	5.236	4.22**	20.342	5.628	18.816	5.688	7.78**
ACT Social St.	21.316	5.411	21.371	5.038	.19	21.965	2.064	20.921	5.276	5.87**
ACT Nat. Science	20.789	5.403	20.236	5.147	1.90	21.377	5.197	20.302	5.417	5.87**
High School GPA	2.836	0.595	2.718	0.545	3.69**	3.076	0.674	2.919	0.678	7.14**

* $p < .05$

** $p < .01$

[a]Test of significance of difference

The actual differences on ACT scores and high school grades between students with and without follow-up data are not large relative to the standard deviations of these variables. On the extracurricular achievement scales, only a few differences are significant, and these fall into no consistent pattern. It appears, therefore, that although there are some significant differences between students with and without follow-up data, it is unlikely that the results of this study are seriously distorted by these differences because virtually a full range of accomplishment is present in the groups with follow-up data.

To summarize, because the colleges used such diverse means of administering the survey and because there are significant differences between students with and without follow-up data, our samples may not be a precise representation of the college populations included. Nevertheless, our samples do represent a broad range of students from diverse institutions. Because most earlier studies of this problem were based on a narrow range of talent, the present samples more definitively examine the relationships in question.

Criteria of Achievement. The criterion variables included the following measures:

1. College Grades. Each student reported his grade average for his last college term by checking one of the following alternatives: D or lower, D+, C, C+, B, B+, A or A+. Scores from 1 to 7 were assigned to these alternatives so that a high score indicates high grades.

2. Non-classroom Achievement Record. We developed a checklist

of non-academic accomplishments to measure achievement in the following areas: leadership, social participation, art, social service, science, business, humanities, religious service, music, writing, social science, and speech and drama. We also developed a simple scale to determine public recognition for academic attainment in college. Each scale is, in a sense, a criterion or standard of accomplishment in an important area of human endeavor. Students with high scores on one or more scales are assumed to have attained a high level of accomplishment which required complex skills, long term persistence, or originality, and which generally received public recognition. A detailed account of the rationale, development, and statistical characteristics of these scales is presented elsewhere (Richards, Holland, & Lutz, 1966).

Each scale includes ten items, except the Recognition for Academic Accomplishment Scale which has five items. In responding to the items, the student marks "yes" for those accomplishments which he has achieved during college and "no" for those which he has not achieved. The score on each scale is simply the number of "yes" responses.

Items range from common and less important accomplishments to rare and more important ones. For example, leadership accomplishments included: elected to one or more student offices, active member of four or more student groups, served on a student-faculty committee. Music accomplishments included: composed or arranged music which was publicly performed, publicly performed on two or more music instruments (including voice) which do not belong to the same family of instruments,

attained a first division rating in a state or regional solo music contest. The remaining scales consisted of similar items with content appropriate to the various areas of achievement. In general, the accomplishments involve public action or recognition, so that, in principle, they could be verified. We assumed such possibility of verification would lessen student exaggeration and allow a comparison of student self-reports with public records.

Table 2

K-R 20 Reliabilities of College Achievement Scales for College Freshmen and Sophomores

Scale	Men		Women	
	Fresh. (N=1576)	Soph. (N=2293)	Fresh. (N=1571)	Soph. (N=2834)
Scientific Achievement	.68	.65	.45	.40
Leadership Achievement	.77	.74	.67	.73
Speech and Dramatic Achievement	.68	.68	.62	.65
Artistic Achievement	.58	.69	.67	.69
Writing Achievement	.48	.60	.44	.58
Musical Achievement	.59	.70	.61	.58
Social Participation	.72	.66	.64	.60
Social Service Achievement	.68	.64	.58	.56
Business Achievement	.57	.44	.30	.33
Humanistic-Cultural Achievement	.56	.61	.62	.61
Religious Service	.79	.85	.79	.82
Social Science Achievement	.33	.46	.25	.37
Recognition for Academic Accomplishment	.31	.41	.41	.50

Note. --These coefficients were computed using all students in the American College Survey follow-ups, regardless of whether or not they had taken the ACT battery as part of their application for college.

The reliabilities (K-R 20) of these scales for college freshmen and sophomores are summarized in Table 2. The reliabilities in Table 2 were computed using all students in the American College Survey follow-up,

regardless of whether or not they had taken the ACT battery as part of their application for college. With a few exceptions, the scales possess moderate reliabilities for college freshmen and sophomores. Reliabilities for college seniors are presented elsewhere (Richards et al., 1966).

The non-classroom college achievement scales were administered as part of a comprehensive follow-up of the American College Survey (Abe et al., 1965). The follow-up questionnaire elicited information about a college student's achievements, aspirations, self-concept, satisfactions, and attitudes.

Results

The means and standard deviations of the college achievement scales for the various samples are summarized in Table 3. The distributions of the non-academic accomplishments are highly skewed, and the standard deviations are larger than the means.[2] This skewness occurs because each scale contains accomplishments that are rare among college students. (The modal number of accomplishments on most scales is zero.) Differences among the areas of accomplishment probably reflect differences both in the level of accomplishment represented by the various items and in the opportunity for various kinds of achievement in college.

As a next step, correlations were computed among all of the variables, both predictor and criterion.[3] Results for freshmen are shown in Table 4

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[2]The skewness of such distributions has had little effect in previous studies, however, on Pearson correlations involving similar variables (Holland & Richards, 1965).

[3]Computations for this study were carried out at Measurement Research Center, University of Iowa, and at the University of Utah Computer Center.

Table 3

Means and Standard Deviations on College Achievement Scales for the Student Samples

Scale	Men			
	Fresh. (N=503)		Soph. (N=1373)	
	Mean	S.D.	Mean	S.D.
Scientific Achievement	.18	.68	.32	.86
Leadership Achievement	.63	1.30	.88	1.53
Speech and Dramatic Achievement	.31	.81	.30	.90
Artistic Achievement	.38	.87	.48	1.07
Writing Achievement	.31	.73	.27	.73
Musical Achievement	.16	.61	.21	.73
Social Participation	.80	1.35	.90	1.39
Social Service Achievement	.55	1.07	.70	1.21
Business Achievement	.54	.91	.68	1.00
Humanistic-Cultural Achievement	.94	1.21	1.04	1.33
Religious Service	.73	1.48	1.34	2.20
Social Science Achievement	.24	.57	.33	.70
Recognition for Academic Accomplishment	.14	.46	.36	.69
	Women			
	Fresh. (N=592)		Soph. (N=1419)	
	Mean	S.D.	Mean	S.D.
Scientific Achievement	.07	.32	.10	.39
Leadership Achievement	.72	1.33	1.40	1.83
Speech and Dramatic Achievement	.26	.75	.36	.93
Artistic Achievement	.67	1.20	.85	1.34
Writing Achievement	.39	.75	.50	1.01
Musical Achievement	.14	.52	.27	.73
Social Participation	.77	1.30	1.03	1.34
Social Service Achievement	.83	1.24	1.20	1.40
Business Achievement	.22	.51	.34	.65
Humanistic-Cultural Achievement	1.23	1.42	1.45	1.48
Religious Service	1.30	2.06	1.98	2.41
Social Science Achievement	.27	.54	.32	.60
Recognition for Academic Accomplishment	.14	.40	.44	.81

and for sophomores in Table 5. Correlations for males are presented above the diagonal and correlations for females below the diagonal. In

Table 4

Correlations among Predictor and Criterion Variables for College Freshmen

	Predictors											Criteria												
	hs sci 1	hs lead 2	hs dra 3	hs art 4	hs lit 5	hs mus 6	ACT E 7	ACT M 8	ACT SS 9	ACT NS 10	hs GPA 11	col sci 12	col lead 13	col s&d 14	col art 15	col wri 16	col mus 17	col s.pa 18	col s.sr 19	col bus 20	col h-c 21	col rel 22	col s.sc 23	col rec 24	col GPA 25
1.	--	16	10	19	17	19	10	09	08	15	19	31	13	03	17	05	13	07	07	-02	09	04	03	19	07
2.	18	--	37	06	31	18	10	09	11	05	19	01	29	17	05	11	03	28	11	-03	18	-02	04	16	03
3.	14	31	--	14	43	24	04	-02	08	-01	02	-04	24	34	13	26	08	19	13	-01	22	-01	05	03	-01
4.	12	16	10	--	21	13	-01	00	04	04	05	03	04	02	41	07	04	-01	07	02	09	01	03	08	10
5.	12	32	32	18	--	13	14	08	12	02	07	-02	21	17	18	43	02	21	06	-03	33	01	10	13	08
6.	26	18	21	03	09	--	03	03	-02	06	02	02	10	09	07	10	41	03	13	-08	06	14	00	05	00
7.	-01	01	07	04	14	06	--	59	61	59	39	00	00	-03	-05	06	-03	01	-01	-14	02	-11	-06	10	22
8.	01	00	-03	-03	02	08	51	--	50	57	47	04	03	-06	-03	00	-02	00	-04	-04	00	-06	-10	12	21
9.	01	02	09	06	14	01	60	46	--	68	35	02	08	-01	03	06	-10	13	01	-10	06	-10	05	08	29
10.	04	-02	07	02	11	03	57	55	61	--	34	08	02	-09	02	01	-07	09	03	-10	-05	-10	-06	09	26
11.	07	14	03	-05	04	06	31	41	32	34	--	05	05	01	03	-01	-04	01	02	-08	03	-04	-01	23	22
12.	22	10	06	07	07	02	02	03	-03	01	05	--	08	07	14	12	13	08	09	29	17	04	24	33	08
13.	11	25	24	04	05	14	06	04	06	03	05	12	--	34	30	24	17	53	45	16	21	26	13	27	10
14.	05	08	44	-02	06	15	-01	-05	00	01	-01	09	24	--	28	28	21	34	33	20	22	17	22	08	05
15.	13	17	12	49	13	10	05	-04	04	05	-08	26	14	19	--	26	17	19	29	16	24	13	28	18	13
16.	08	14	27	13	44	02	09	00	07	09	04	10	17	27	28	--	10	19	20	08	44	05	31	13	08
17.	08	05	16	01	05	35	01	-06	-05	-03	-02	22	17	28	23	16	--	10	19	09	09	11	17	11	00
18.	17	33	23	14	29	07	04	-03	07	00	00	21	34	35	35	31	15	--	38	14	24	21	17	18	10
19.	12	21	20	04	11	11	00	04	05	-02	01	22	38	33	29	26	20	54	--	23	18	40	19	18	07
20.	01	06	07	05	01	03	-12	-08	-10	-12	-04	32	19	13	14	08	19	20	25	--	15	21	20	20	-04
21.	07	19	21	18	33	05	08	-04	11	03	06	26	20	24	31	39	23	39	33	17	--	16	40	22	13
22.	06	07	13	00	03	08	-05	-02	-01	-04	02	13	15	23	11	17	22	18	39	22	18	--	10	17	-02
23.	08	11	17	13	20	03	-03	-05	06	-04	-02	12	13	22	20	28	06	34	29	10	43	15	--	11	06
24.	13	18	14	04	11	10	16	18	14	16	19	18	23	14	12	14	14	16	22	18	24	13	16	--	25
25.	09	08	06	-02	09	06	30	29	35	32	37	02	14	01	00	11	-01	06	03	-06	13	-03	01	26	--

Note. --Correlations for males (N=503) are shown above the diagonal and for females (N=592) below the diagonal.

general, there are: (1) moderate correlations among measures of academic potential and performance, (2) moderate correlations among non-classroom achievements in the same or closely related areas, (3) low to moderate correlations among non-classroom achievements in areas which are not closely related, and (4) low relationships between non-classroom achievements and measures of academic potential and performance. These relationships are consistent with what previous investigators have found (Holland, 1958, 1959, 1960, 1961; Holland & Astin, 1962; Nichols & Holland, 1963; Holland & Nichols, 1964; Holland & Richards, 1965).

The most important of these findings is the low relationship between non-classroom achievements and measures of academic potential and performance. The correlations in Tables 4 and 5 are based, of course, on combining students at the various colleges into a single group. Although it is unlikely, this low relationship might be an artifact of combining students in different colleges. To check this possibility, the correlations between academic predictors and all criteria for male sophomores at individual colleges were computed and are presented in Table 6. The information in Table 6 is restricted to the 14 colleges having 25 or more students with complete data.

The data in Table 6 indicate that there is indeed considerable variation among colleges in the relationship between individual predictors and individual criteria. However, the median correlations in Table 6, in every case, are very close to the corresponding correlations in Table 5

Table 5

Correlations among Predictor and Criterion Variables for College Sophomores

	Predictors											Criteria													
							ACT																			
	hs sci	hs lead	hs dra	hs art	hs lit	hs mus	E	M	SS	NS	hs GPA	col sci	col lead	col s&d	col art	col wri	col mus	col s.pa	col s.sr	col bus	col h-c	col rel	col s.sc	col rec	col GPA
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.	--	28	30	24	33	25	15	16	13	21	18	40	14	07	09	13	08	15	10	17	16	05	07	17	10
2.	23	--	48	18	33	25	09	04	07	03	21	11	28	12	12	14	08	32	25	15	20	13	16	14	07
3.	28	43	--	24	44	36	07	-04	03	00	09	15	26	33	19	24	21	30	25	16	23	15	14	12	05
4.	20	13	22	--	28	21	-01	-09	-01	-03	-10	09	06	12	44	21	08	16	12	12	20	02	10	00	-02
5.	19	39	43	17	--	21	15	05	14	07	08	19	22	22	20	45	09	28	20	15	35	08	17	19	09
6.	26	26	30	15	18	--	10	00	04	03	02	05	12	10	11	08	49	14	12	11	11	08	06	08	01
7.	11	11	09	03	21	08	--	57	56	54	41	05	04	01	00	13	02	02	-03	-05	10	-02	-05	32	28
8.	11	08	00	-04	09	07	53	--	45	57	44	04	02	-08	-10	-01	-05	-03	-07	-06	-03	-01	-10	32	31
9.	09	07	06	01	19	02	59	48	--	64	35	06	07	01	01	10	-03	09	-02	-04	19	-06	03	27	32
10.	15	06	05	05	12	05	52	56	62	--	36	11	06	-03	-01	03	-01	02	-02	01	09	-02	-01	26	27
11.	13	23	12	-04	17	08	37	38	35	31	--	05	04	-04	-10	01	-03	-05	-07	-05	01	03	-08	34	39
12.	24	03	05	05	03	04	-01	06	00	04	06	--	22	17	24	23	11	22	21	30	25	14	24	24	09
13.	13	35	24	09	25	14	17	16	17	12	17	07	--	29	22	27	17	44	51	27	23	21	28	23	13
14.	04	14	39	12	21	09	00	-09	-02	-05	-03	15	20	--	29	41	29	27	30	23	29	23	21	09	03
15.	12	09	21	51	12	07	-02	-06	-04	-01	-08	12	19	25	--	30	18	31	26	25	33	07	23	04	-01
16.	15	18	24	16	46	08	15	03	11	06	04	16	25	27	20	--	19	31	25	23	46	12	28	15	07
17.	09	10	20	09	12	39	04	-04	-02	-02	00	13	14	30	15	17	--	21	20	23	19	18	18	07	-05
18.	14	30	25	12	28	07	04	03	04	04	00	17	37	26	31	27	15	--	45	29	38	16	37	11	02
19.	16	21	21	12	16	13	06	02	04	01	01	14	46	23	27	21	21	40	--	37	22	32	22	12	01
20.	09	12	13	00	10	05	-02	00	-05	-03	-03	22	24	17	12	23	14	20	27	--	23	18	24	08	-05
21.	15	17	24	17	29	10	17	03	19	13	07	18	17	29	26	37	21	33	25	15	--	14	49	15	07
22.	04	07	09	04	06	13	-04	-04	-08	-04	02	14	13	18	13	11	19	15	34	16	10	--	14	11	05
23.	07	12	14	13	19	07	02	-03	06	02	-03	18	11	14	18	27	10	28	19	20	44	14	--	11	00
24.	15	16	13	04	16	08	34	33	33	32	37	18	38	07	05	16	10	11	18	11	18	09	11	--	44
25.	09	15	07	-02	14	12	37	35	36	28	43	09	27	05	00	10	10	05	15	06	15	06	07	42	--

Note. --Correlations for males (N=1373) are shown above the diagonal and for females (N=1419) below the diagonal.

Table 6

Relationships of ACT Tests and High School Grades to College Achievement for Male Sophomores at Individual Colleges

Criteria	ACT English		ACT Math		ACT Social Studies		ACT Nat. Sci.		HS GPA	
	Range	Median	Range	Median	Range	Median	Range	Median	Range	Median
Scientific Achievement	-20 to 26	07	-10 to 25	05	-28 to 31	15	-04 to 32	12	-24 to 18	01
Leadership Achievement	-17 to 23	04	-12 to 16	05	-39 to 28	02	-14 to 21	04	-34 to 31	00
Speech & Dramatic Ach.	-47 to 28	06	-39 to 29	-05	-32 to 34	03	-24 to 22	-07	-20 to 16	-01
Artistic Achievement	-28 to 49	05	-34 to 16	-06	-32 to 32	04	-18 to 17	-01	-36 to 14	-10
Writing Achievement	-26 to 45	15	-45 to 26	-01	-30 to 39	12	-32 to 29	04	-28 to 20	00
Musical Achievement	-29 to 21	03	-29 to 07	-06	-22 to 26	-02	-28 to 22	02	-22 to 20	00
Social Participation	-37 to 33	09	-46 to 08	00	-49 to 26	12	-37 to 20	05	-45 to 10	-06
Social Service Achievement	-26 to 16	-06	-28 to 11	-07	-35 to 11	01	-20 to 05	-03	-49 to 13	-09
Business Achievement	-18 to 11	-03	-29 to 28	-07	-23 to 07	-02	-17 to 27	05	-47 to 21	-03
Humanistic-Cultural Ach.	-33 to 39	15	-51 to 25	-06	-12 to 41	20	-42 to 28	09	-16 to 16	04
Religious Service	-26 to 11	-03	-23 to 20	-06	-26 to 05	-07	-26 to 27	-04	-12 to 16	01
Social Science Achievement	-52 to 17	-02	-53 to 11	-09	-20 to 22	07	-25 to 12	-02	-37 to 21	-09
Recognition for Academic Acc.	-15 to 53	29	-22 to 47	27	-24 to 57	26	-51 to 38	27	-33 to 53	30
College GPA	-11 to 46	23	13 to 52	29	00 to 58	30	-10 to 47	25	-08 to 48	40

which were calculated using all students combined. Moreover, the differences among colleges apparently are more random than consistent and meaningful. These results indicate, therefore, that combining students from different colleges has not distorted the relationships between variables and suggest that, in fact, the correlations based on the combined students are the best estimate of these relationships. Correlations at individual colleges for the other samples and other variables in this study supported this interpretation.

As our next step, we computed multiple correlations by selecting the most efficient predictors of each criterion from the eleven predictor variables. We used a step-wise multiple regression computer program, which, at each step, adds the variable which most improves prediction. This computer program computes an F test after each step to test the significance of the reduction of residual variance caused by the addition of the variable in that step. For the final multiple regression equation, the computer retains only those variables producing a significant reduction in residual variance.

We found, however, that many variables which produced a statistically significant reduction in residual variance had no practical effect on the size of the multiple correlation. Accordingly, rather than using a statistical test, we decided to retain only those variables which increased the multiple correlation by at least .01. In every case, the number retained using this criterion is smaller than the number retained using a statistical test of significance as the criterion.

Eight of the criterion variables--college grades, leadership, art, science, music, writing, speech and drama, and recognition for academic accomplishment--were designed specifically to assess at the college level the same characteristics the predictors measure at the high school level. The beta weights and multiple correlations for these criteria for freshmen are summarized in Table 7 and those for sophomores are summarized in Table 8.

The most notable finding in Tables 7 and 8 is the great importance of specific content in predicting achievement. For the non-academic accomplishment scales, the best predictor of accomplishment in college is similar accomplishment in high school, and in the majority of cases similar high school accomplishment is the only variable contributing to the prediction of college accomplishment. Moreover, in every remaining case, the prediction of non-academic accomplishment is improved only slightly by adding variables to the corresponding high school achievement scales--an improvement likely to disappear on cross-validation. These findings are consistent, of course, with a substantial literature which reveals that past performance predicts future performance.

For the two measures of academic accomplishment, the most consistently high predictor is high school grades, and, in general, some weighted combination of high school grades and ACT test scores is a better predictor than high school grades alone. This finding, too, is consistent with a large number of previous investigations of the prediction of academic performance.

Table 7

Multiple Correlations for College Freshmen for Criteria of Achievement Highly Comparable to the High School Achievement Scales

Criterion	Men (N=503)			Women (N=592)		
	Predictors	Beta	R	Predictors	Beta	R
College Grades	ACT Social Studies	.2406	.29	High School Grades	.2874	.37
	High School Grades	.1316	.32	ACT Social Studies	.2580	.44
	Art Achievement (HS)	.0838	.33			
Leadership Ach. (Col.)	Leadership Ach.(HS)	.2331	.29	Leadership Ach.(HS)	.1934	.25
	Drama Ach. (HS)	.1538	.32	Drama Ach. (HS)	.1798	.30
Artistic Achievement (Col.)	Art Achievement (HS)	.3894	.41	Art Achievement (HS)	---	.49
	Literary Ach. (HS)	.0984	.42			
Scientific Ach. (Col.)	Science Ach. (HS)	---	.31	Science Ach. (HS)	---	.22
Musical Ach. (Col.)	Music Ach. (HS)	.4157	.41	Music Ach. (HS)	.3310	.35
	ACT Natural Science	-.0950	.42	Drama Ach (HS)	.0905	.36
Writing Achievement (Col.)	Literary Ach. (HS)	---	.43	Literary Ach. (HS)	.3939	.44
				Drama Ach. (HS)	.1439	.46
Speech & Drama Ach.(Col.)	Drama Ach. (HS)	.3391	.34	Drama Ach. (HS)	---	.44
	ACT Natural Science	-.0861	.35			
Recognition for Academic Accomplishment (Col.)	High School Grades	.1841	.23	High School Grades	.1079	.19
	Science Ach.(HS)	.1386	.27	Leadership Ach. (HS)	.1211	.25
	Leadership Ach. (HS)	.1028	.29	ACT Mathematics	.1376	.27
				Drama Ach. (HS)	.0913	.29
				Science Ach. (HS)	.0865	.30

Note.--In this and the following three tables, only variables increasing the multiple correlation by at least .01 are retained. The correlation shown beside each variable is the multiple correlation with the designated criterion of that variable plus those listed above it. Abbreviations in parentheses are as follows: Col. = College, HS = High School.

Table 8

Multiple Correlations for College Sophomores for Criteria of Achievement Highly Comparable to the High School Achievement Scales

Criterion	Men (N=1373)			Women (N= 1419)		
	Predictors	Beta	R	Predictors	Beta	R
College Grades	High School Grades	.3168	.39	High School Grades	.3162	.43
	ACT Social Studies	.2091	.44	ACT English	.1625	.48
				ACT Social Studies	.1535	.50
Leadership Ach. (Col.)	Leadership Ach. (HS)	.1857	.28	Leadership Ach. (HS)	.2984	.35
	Drama Ach. (HS)	.1253	.31	ACT Social Studies	.1283	.38
	Literary Ach. (HS)	.1036	.33	Literary Ach. (HS)	.1092	.39
Artistic Achievement (Col.)	Art Achievement (HS)	---	.44	Art Achievement (HS)	---	.51
Scientific Ach. (Col.)	Science Ach. (HS)	---	.40	Science Ach. (HS)	---	.24
Musical Ach. (Col.)	Music Ach. (HS)	---	.49	Music Ach. (HS)	---	.39
Writing Ach. (Col.)	Literary Ach. (HS)	---	.45	Literary Ach. (HS)	---	.46
Speech & Drama Ach. (Col.)	Drama Ach. (HS)	.2892	.33	Drama Ach. (HS)	.3900	.39
	Literary Ach. (HS)	.0928	.34	ACT Mathematics	-.0900	.40
Recognition for Academic Accomplishment (Col.)	High School Grades	.2113	.34	High School Grades	.2619	.37
	ACT English	.1276	.39	ACT English	.1630	.43
	Literary Ach. (HS)	.1466	.42	ACT Natural Science	.1541	.45
	ACT Mathematics	.1470	.43			

The information in Tables 7 and 8 also confirms earlier findings that academic potential and success have little relationship to effective non-academic performance (Astin, 1962; Getzels & Jackson, 1962; MacKinnon, 1960; Torrance, 1963; Price et al., 1964; Holland & Nichols, 1964; Gough et al., 1963; Hoyt, 1965; and Thorndike & Hagen, 1959). In these tables, academic predictors relate to academic criteria and non-classroom predictors relate to non-classroom criteria. Thus there is both convergent and discriminant validity. This is especially important in the case of the Recognition for Academic Accomplishment Scale. This scale is a self-report of achievements comparable to the non-classroom achievement scales. Furthermore, the items for this scale were mixed with items from the non-classroom achievement scales in the same section of the follow-up questionnaire. Unlike the non-classroom achievement scales, however, we designed this scale so it should be correlated with academic predictors. Because this scale was correlated with academic predictors and the non-classroom achievement scales were not, the results make it less plausible that response bias, dissimulation, or similar occurences invalidate student responses to these scales. In other words, the results imply that the average student gave a frank account of his accomplishments in high school and in college.

The remaining six criterion scales make our assessment of student accomplishment more comprehensive; but they were not planned to measure achievement in the same areas measured by the high school achievement scales. It was expected, then, that the multiple correlations

between these criteria and the predictors would be lower than the correlations for the criteria that are highly comparable to the high school achievement scales. The multiple correlations for these criteria are summarized for freshmen in Table 9 and for sophomores in Table 10.

The multiple correlations in Tables 9 and 10 are much lower than the multiple correlations in Tables 7 and 8. In Tables 9 and 10, there is some tendency for those scales that are most similar to the high school achievement scales to be most predictable, and for the most similar high school scale to be the best predictor of the score on the similar college achievement scale. For example, high school Leadership Achievement is the best predictor of college Social Participation, and high school Literary Achievement is the best predictor of college Humanistic-Cultural Achievement. For the most part, the correlations in Tables 9 and 10 support the conclusion that academic predictors contribute little to the prediction of non-classroom accomplishment.

Again, probably the most striking thing suggested by Tables 9 and 10 is the importance of specific content. For the college criteria having no corresponding high school predictors, the variables selected for predicting the various criteria, and their beta weights, are not highly comparable for freshmen and sophomores. One would expect, therefore, the already low multiple correlations to drop on cross validation. Consequently, a better approach to predicting these variables would seem to be to construct a high school achievement scale corresponding closely to the college achievement scale. When predictors are available which

Table 9

Multiple Correlations for College Freshmen for Criteria of Achievement
Not Highly Comparable to the High School Achievement Scales

Criterion	Men (N=503)			Women (N=592)		
	Predictors	Beta	R	Predictors	Beta	R
Social Participation (Col.)	Leadership Ach. (HS)	.2325	.28	Leadership Ach. (HS)	.2482	.33
	Literary Ach. (HS)	.1365	.31	Literary Ach. (HS)	.1984	.38
	ACT Social Studies	.1717	.32	Science Ach. (HS)	.1015	.40
	ACT English	-.1371	.34			
Social Service Ach. (Col.)	Drama Ach. (HS)	.1048	.13	Leadership Ach. (HS)	.1637	.21
	Music Ach. (HS)	.1048	.17	Drama Ach. (HS)	.1492	.25
Business Ach. (Col.)	ACT English	-.1377	.14	ACT English	-.0800	.12
	Music Ach. (HS)	-.0759	.16	Drama Ach. (HS)	.0812	.14
				ACT Natural Science	-.0800	.16
Humanistic-Cultural Achievement (Col.)	Literary Ach. (HS)	.2888	.33	Literary Ach. (HS)	.2730	.33
	Drama Ach. (HS)	.0958	.34	Art Achievement (HS)	.1198	.35
				Drama Ach. (HS)	.1107	.37
Religious Service (Col.)	Music Ach. (HS)	.1434	.14	Drama Ach. (HS)	.1221	.13
	ACT English	-.1143	.18	ACT English	-.0620	.14
				Music Ach. (HS)	.0581	.15
Social Science Ach. (Col.)	Literary Ach. (HS)	.0915	.10	Literary Ach. (HS)	.1470	.20
	ACT Mathematics	-.1366	.15	Drama Ach. (HS)	.1138	.23
	ACT Social Studies	.1794	.18	Art Achievement (HS)	.0922	.25
	ACT Natural Science	-.1059	.20			

Table 10

Multiple Correlations for College Sophomores for Criteria of Achievement Not Highly Comparable to the High School Achievement Scales

Criterion	Men (N=1373)			Women (N=1419)		
	Predictors	Beta	R	Predictors	Beta	R
Social Participation (Col.)	Leadership Ach. (HS)	.2340	.32	Leadership Ach. (HS)	.2423	.30
	Literary Ach. (HS)	.1404	.37	Literary Ach. (HS)	.2008	.35
	High School Grades	-.1597	.39	High School Grades	-.0899	.36
	Drama Ach. (HS)	.1371	.40			
	ACT Social Studies	.1057	.42			
Social Service Ach. (Col.)	Leadership Ach. (HS)	.1825	.25	Leadership Ach. (HS)	.1342	.21
	Drama Ach. (HS)	.1338	.29	Drama Ach. (HS)	.1260	.25
	High School Grades	-.1277	.32	Science Ach. (HS)	.0938	.26
	Literary Ach. (HS)	.0911	.33			
Business Ach. (Col.)	Science Ach. (HS)	.1373	.17	Drama Ach. (HS)	.0985	.13
	Drama Ach. (HS)	.0834	.20	Leadership Ach. (HS)	.0820	.15
	High School Grades	-.1020	.22	ACT Social Studies	-.0617	.16
	Leadership Ach. (HS)	.0929	.24			
Humanistic-Cultural Achievement (Col.)	Literary Ach. (HS)	.2974	.35	Literary Ach. (HS)	.1899	.29
	ACT Social Studies	.2073	.38	ACT Social Studies	.1453	.32
	ACT Mathematics	-.1285	.40	Drama Ach. (HS)	.1257	.35
	Art Ach. (HS)	.1072	.41	Art Ach. (HS)	.1086	.36
Religious Service (Col.)	Drama Ach. (HS)	.1135	.15	Music Ach. (HS)	.1134	.13
	Leadership Ach. (HS)	.0804	.16	ACT Social Studies	-.0859	.15
	ACT Social Studies	-.0609	.18	Drama Ach. (HS)	.0611	.16
Social Science Ach. (Col.)	Literary Ach. (HS)	.1330	.17	Literary Ach. (HS)	.1729	.19
	Leadership Ach. (HS)	.1414	.20	Art Ach. (HS)	.1006	.21
	High School Grades	-.1203	.23			

are expected to have substantial validity on rational grounds and on the basis of previous research, as was the case with the highly comparable high school and college achievement scales in this study, they may not necessarily be improved (on cross-validation) by adding variables selected from a large number of predictors to maximize the multiple correlation. Indeed, because the multiple correlation may weight the single, dependable predictor inappropriately in the process of combining it with other variables, the validity of the weighted combination may actually be lower than the validity of the single variable alone in a new sample (Holland & Nichols, 1964).

Discussion

The present study demonstrates that it is possible to predict non-academic accomplishment with moderate success, and it extends the similar findings of earlier research on students with high aptitude by showing that this is true for students with a broad range of academic potential. To illustrate, the median correlation between student non-academic accomplishment in high school and in college in the same area of endeavor is about .39; the median correlation between ACT scores and college grades is about .29; and the median correlation between grades in high school and in college is about .38. These values are not strictly comparable, of course, for at least two reasons: many students in the original sample left college because of low grades; and we did not correlate individual ACT tests with grades in specific courses. Nevertheless, the results suggest that the predictive validities of the high

school accomplishment scales[4] are about as high for comparable criteria as the predictive validities of the ACT tests.

This study, therefore, is the culmination of our research to establish that some non-academic accomplishments are independent of academic potential and accomplishment (Holland & Richards, 1965, 1966), that non-academic accomplishment can be assessed with moderate reliability (American College Testing Program, 1965; Richards et al., 1966), and that non-academic potential can be predicted with moderate success (Holland & Nichols, 1964). The evidence also makes it unlikely that our results can be attributed to non-linear relationships between academic and non-academic accomplishment (Holland & Richards, 1965), to defective scaling of non-academic accomplishments (Holland & Nichols, 1964; Holland & Richards, 1965), to a narrow range of student talent (Holland & Richards, 1965, 1966), to a student's distortion of his non-academic accomplishment (Holland & Richards, 1966; Richards et al., 1966), or to the effects of some moderator variables (Holland & Richards, 1966). These results also support many of the findings of investigators of creative and effective performance (Gough et al., 1963; MacKinnon, 1960; Price et al., 1964; Thorndike & Hagen, 1959; and others). The recent review by Hoyt (1965) provides still another important piece of evidence that classroom grades bear little or no relationship to measures of adult accomplishment.

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[4]For the following six scales: Science, Art, Music, Literary, Drama, and Leadership.

Because our criteria of non-academic accomplishment are only a sample of such accomplishment, possibly academic potential and accomplishment may have substantial positive correlations with some non-academic accomplishments. The negligible relationships observed so far, however, make this possibility unlikely. While only an exhaustive examination of non-academic accomplishments could negate this possibility, some relevant evidence is provided by the six new criteria of non-academic accomplishment[5] developed for this study. The negligible relationships between measures of academic potential and performance and these new criteria of non-academic accomplishment reinforce earlier findings and lessen the possibility of finding some substantial positive correlations.

As always, the present research leaves a number of closely related questions unanswered. It is not yet known whether non-classroom accomplishments in high school and college are good predictors of similar accomplishment in adult life. Little is known about the college experiences that facilitate and inhibit the expression of talent in college after a record of talented performance is made in high school. The apparent contradictions between the findings of Terman and Oden (1959) and the findings of more recent investigations, such as the present study, need to be resolved. Similarly, the relationship of such work as Thurstone's primary mental abilities (1938) and Vernon's hierarchy of abilities (1950) to non-academic accomplishment requires explication. A theory of human accomplishment

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[5]These criteria are: Social Participation, Social Service Achievement, Business Achievement, Humanistic-Cultural Achievement, Religious Service, and Social Science Achievement.

encompassing our notions of intelligence, aptitude, non-academic accomplishment, and originality would help us find answers to these questions.

Some of the practical applications of our findings seem clear. Measures of academic potential are the chief methods used to determine admission to college (Committee on School and College Relations, 1964). So long as one is interested only in finding students who will do well in the classroom in college, this emphasis is appropriate. But the emphasis in colleges and universities on academic potential, because it concentrates on only one of several independent dimensions of talent, has led to neglect of other equally important talents. Certainly, in the interest of social and human values, one should also be interested in finding students who will do outstanding things outside the classroom and in later life.

We should, therefore, continue to develop and improve measures of many kinds of achievement and of originality. Further, we should consider such measures important in their own right, and not weak supplementary measures to remedy the slight defects of conventional aptitude and achievement tests. At the same time, we should not make the same mistake that the proponents of aptitude and intelligence have made in the past; that is, to rely on only one kind of measure and to exclude others. The results support some of the items used to obtain information about non-classroom accomplishment in typical application blanks for admission to college, scholarships, and fellowships, but they also suggest the potential usefulness of a more reliable and valid record of each student's past achievement and involvement.

The implications of this study, however, extend beyond a need for a more systematic and comprehensive assessment of student accomplishment outside the classroom for purposes of admission or selection. At the very least, the findings imply a need to examine college grading practices, since college education should be largely a preparation for participation in important areas of human endeavor. Because college grades best predict graduate grades, current grading practices imply that a college education is mainly preparation for more education in graduate school. The criteria of non-academic accomplishment, in combination with college grades, provide a brief set of socially relevant measures which could serve as more comprehensive criteria of college success. Using these scales as guides, similar scales can be developed to increase our ability to assess student attainment of the broader goals of a college education. Moreover, once the simple principles of constructing such scales are grasped, it should be easy to develop scales to satisfy a particular college's unique needs.

Further, the results imply a need for a broader, or different, definition of both the nature of human talent and the nature of higher education. There are many kinds of human accomplishment, and each kind is likely to benefit from some type of higher education, although not necessarily a highly academic type. In other words, our results imply a need for a wide variety of colleges, many, if not most of them, relatively unselective except on dimensions clearly relevant to their particular emphasis. Measures of academic and non-academic accomplishment would then be

used in helping students find an appropriate college, rather than being used in selecting students for a single college.

As one critic of education said, a society (or a system of higher education) is "in a desperate way when its music makes little difference" (Goodman, 1966). Despite contrary protestations, most institutions of higher education rely heavily on academic aptitude and grades in selecting and evaluating students. Music, and other important human accomplishments, make little difference.

References

Abe, C., Holland, J. L., Lutz, Sandra W., & Richards, J. M., Jr. A description of American college freshmen. Iowa City: American College Testing Program, 1965.

American College Testing Program. ACT technical report. Iowa City: Author, 1965.

Astin, A. W. A note on the relationship between creative and academic achievement. Evanston, Ill.: National Merit Scholarship Corp., 1962.

Barron, F. Creativity and psychological health. Princeton, N. J.: Van Nostrand, 1963.

Buel, W. D. Biographical data and the identification of creative research personnel. Journal of Applied Psychology, 1965, 45, 318-321.

Chambers, J. A. Relating personality and biographical factors to scientific creativity. Psychological Monographs, 1964, 78, 7 (No. 584).

Cicirelli, V. G. Form of the relationship between creativity, I. Q., and academic achievement. Journal of Educational Psychology, 1965, 56, 303-308.

Committee on School and College Relations. Admission to American colleges. New York: Educational Records Bureau, 1964.

Davidsen, O. M. Reliability of self-reported high school grades. Unpublished research report, American College Testing Program, 1963.

Eells, K. How will the ACT tests serve Illinois needs?--A research report. Committee on Freshman Testing, Illinois Joint Council on Higher Education, 1962.

Flescher, I. Anxiety and achievement of intellectually gifted and creatively gifted children. Journal of Psychology, 1963, 56, 251-268.

Getzels, J. W., & Jackson, P. W. Creativity and intelligence: explorations with gifted students. New York: Wiley, 1962.

Goodman, P. Compulsory miseducation and The community of scholars. New York: Vintage, 1966.

Gough, H. G., Hall, R. E., & Harris, W. B. Admissions procedures as forecasters of performance in medical education. Journal of Medical Education, 1963, 38, 983-998.

Guilford, J. P. Some new looks at the nature of creative processes. In N. W. Frederiksen and H. Gulliksen (Eds.), Contributions to mathematical psychology. New York: Holt, Rhinehart, and Winston, 1964. Pp. 161-176.

Holland, J. L. A personality inventory employing occupational titles. Journal of Applied Psychology, 1958, 42, 336-342.

Holland, J. L. The prediction of college grades from the California Psychological Inventory and the Scholastic Aptitude Test. Journal of Educational Psychology, 1959, 50, 135-142.

Holland, J. L. The prediction of college grades from personality and aptitude variables. Journal of Educational Psychology, 1960, 51, 245-254.

Holland, J. L. Creative and academic performance among talented adolescents. Journal of Educational Psychology, 1961, 52, 136-147.

Holland, J. L., & Astin, A. W. The prediction of the academic, artistic, scientific, and social achievement of undergraduates of superior scholastic aptitude. Journal of Educational Psychology, 1962, 53, 132-143.

Holland, J. L., & Nichols, R. C. Prediction of academic and extra-curricular achievement in college. Journal of Educational Psychology, 1964, 55, 55-65.

Holland, J. L., & Richards, J. M., Jr. Academic and nonacademic accomplishment: correlated or uncorrelated? Journal of Educational Psychology, 1965, 56, 165-174.

Holland, J. L., & Richards, J. M., Jr. Academic and non-academic achievement in a representative sample from a population of 612,000. Iowa City: American College Testing Program, 1966.

Hoyt, D. P. Three years of research in the American College Testing Program. Paper read at Iowa Psychological Association, Des Moines, 1963.

Hoyt, D. P. The relationship between college grades and adult achievement: a review of the literature. Iowa City: American College

Testing Program, 1965.

Locke, E. A. The development of criteria of student achievement. Educational and Psychological Measurement, 1963, 23, 299-307.

MacKinnon, D. W. What do we mean by talent and how do we test for it? In, The search for talent. New York: College Entrance Examination Board, 1960. Pp. 20-29.

Mann, Sister M. Jacinta. Relationships among certain variables associated with college and post-college success. Unpublished doctoral dissertation, University of Wisconsin, 1958.

Munday, L. Comparative predictive validities of the American College Tests and two other scholastic aptitude tests. Iowa City: American College Testing Program, 1965.

Nichols, R. C., & Holland, J. L. Prediction of the first year college performance of high aptitude students. Psychological Monographs, 1963, 77 (7, Whole No. 570).

Price, P. B., Taylor, C. W., Richards, J. M., Jr., & Jacobsen, T. L. Measurement of physician performance. Journal of Medical Education, 1964, 39, 203-211.

Richards, J. M., Jr., Holland, J. L., & Lutz, Sandra W. The assessment of student accomplishment in college. Iowa City: American College Testing Program, 1966.

Skager, R. W., Schultz, C. B., & Klein, S. P. Quality and quantity of accomplishments as measures of creativity. Journal of Educational Psychology, 1965, 56, 31-39.

Sprecher, T. B. A study of engineers' criteria for creativity. Journal of Applied Psychology, 1959, 43, 141-148.

Taylor, C. W., Smith, W. R., & Ghiselin, B. The creative and other contributions of one sample of research scientists. In C. W. Taylor and F. Barron (Eds.), Scientific creativity: its recognition and development. New York: Wiley, 1963. Pp. 228-250.

Terman, L. M., & Oden, Melita H. Genetic studies of genius. V. The gifted group at midlife. Stanford, Calif.: Stanford University Press, 1959.

Thorndike, R. L., & Hagen, Elizabeth. 10,000 careers. New York: Wiley, 1959.

Thurstone, L. L. Primary mental abilities. Psychometric Monographs, 1938, No. 1.

Torrance, E. P. Education and the creative potential. Minneapolis: University of Minnesota Press, 1963.

Vernon, P. E. The structure of human abilities. London: Methusen, 1950.

Wallach, M. A., & Kogan, N. Modes of thinking in young children: a study of the creativity-intelligence distinction. New York: Holt, Rhinehart, and Winston, 1965.

APPENDIX

Table A

Colleges Included in the Two Follow-Up Samples

Freshmen	Sophomores
Amherst College (Mass.)	Arkansas Polytechnic College
Baldwin-Wallace College (Ohio)	Baylor University (Texas)
Cuyahoga Community College (Ohio)	Black Hills State College (S. Dak.)
California State College at Hayward	Bloom Township Comm. Coll. (Ill.)
Chico State College (Calif.)	Burlington Community College (Iowa)
University of Massachusetts	California State College at Hayward
	Colorado State College
	Fairmont State College (W. Va.)
	Indiana State College (Ind.)
	Jamestown Community College (N. Y.)
	Kansas State University
	Lyons Township Junior College (Ill.)
	New Mexico State University
	Plymouth State College (N.H.)
	Snow College (Utah)
	Southeastern State College (Okla.)
	Southern Illinois University
	University of Alabama
	University of Kentucky
	University of North Dakota
	University of Tennessee
	William Jewell College (Mo.)

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